



Animal sourced foods (ASF): evidence on stunting and programmes to increase consumption

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Question

What is the evidence on the role of Animal Sourced Foods (ASF) i.e. eggs, milk, meat and fish in the prevention of stunting? What literature tells us about the effectiveness of programmes aiming to increase ASF consumption?

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1. Summary

Animal source foods (ASF) are an important source of nutrients. They are a particularly good source of iron and zinc which prevents stunting. A large-scale study across 46 countries finds different patterns of consumption between regions and countries. Broadly, dairy is the most prominent ASF consumed in North Africa and Asia. Western and Central Africa have high fish consumption. Analysis of the whole data set finds significantly higher stunting in children who had not consumed ASF in the last 24 hours. Stunting is reduced more with milk and meat consumption than with consumption of eggs. Data from South Asia derives a 3.3 percentage point decrease in stunting rate with consumption of 1 ASF in a day, and a 7.1 percentage point decrease with consumption of 2 ASF in a day. Statistical studies also show evidence of a link between stunting and ASF in Kenya.

The main factors affecting ASF consumption that were discussed in the literature identified were nutritional knowledge, price, and livestock production. Broader links between poverty and ASF were not discussed within the scope of this report. Nutritional knowledge should first be assessed before education programmes are devised. Many communities have nutritional knowledge and the cost of ASFs was found to be the biggest barrier. Price ratios show how unaffordable ASFs are in poorer regions. Livestock production tends to be positively associated with increased ASF consumption. Increased risk of diseases passed on by animals should be considered. Information may also need to be given so that breast-feeding is not replaced by milk consumption in households that own cows.

A small number of intervention evidence was identified in this rapid review though the list is unlikely to be exhaustive. ASF consumption was found to increase in Nepal following a poverty alleviation programme with a focus on livestock production. A health and nutrition education programme in India found a significant increase in egg consumption. A school-feeding programme which supplemented children with eggs found positive results on stunting.

There are concerns over the environmental impact of animal production which warrant attention. There wasn't scope within this report to explore ASF alternatives which may also improve stunting.

2. Introduction

Animal source foods (ASFs) are an important source of bioavailable nutrients. The variety of nutrients are not available from plant sources alone (Murphy & Allen, 2003). ASFs contain high quality proteins and essential amino acids (Headey, 2018). They also contain bioavailable micronutrients which differ between sources. Milk is high in calcium but low in iron, where as other ASFs are high in iron and low in calcium. They are all a good source of zinc. Evidence shows that zinc¹ and iron deficiency contribute to stunting (Rivera et al., 2003). Headey et al. (2018) note that there is surprisingly little economic research on ASFs and child growth.

¹ https://www.who.int/elena/bbc/zinc_stunting/en/

3. ASF and stunting

A paper from the International Food and Policy Research Institute (IFPRI) and Cornell University analyses a sample of over 112,000 children between 6 and 23 months from 46 countries to analyse ASF consumption (Headey et al, 2017). Dietary patterns noted include:

- Good dietary diversity in Latin America and the Caribbean
- North Africa and Western Asia diets are relatively undiversified. Dairy is the most prominent ASF with around 60 percent having consumed this in the 24 hours before being sampled.
- Dairy is the most commonly consumed ASF in Central, South and South-East Asia although there are regional disparities. In Bangladesh and Cambodia, fish is more important. Egg consumption is high in Bangladesh, Pakistan, Kyrgyzstan and Tajikistan.
- Western and Central Africa have a high fish consumption, one third of children sampled had eaten fish in the previous day. In Eastern and Southern Africa fish consumption is around 20 percent. Ethiopia and Zimbabwe are exceptions, and dairy is more common. Egg consumption is low in Africa.

Analysis of the data from all 46 countries:

- Data plots show a difference in stunting prevalence between children who had consumed an ASF in the last 24 hours and those who had not.
- Parametric tests show a highly significant increase in stunting for children who had not consumed ASF in age brackets 18-20 and 21-23 months. The coefficients suggests ASF consumption reduces stunting by 3.7-3.8 percentage points.
- Analysis on specific ASFs suggest dairy and meat consumption reduces stunting more than egg consumption and the coefficients are statistically stronger.
- Estimates are that dairy consumption reduces stunting by 3.6 percentage points, meat by 2.6 and eggs by 1.7.
- Consumption of fruit also has a significant impact on stunting and maybe a co-factor of translating ASF into growth.

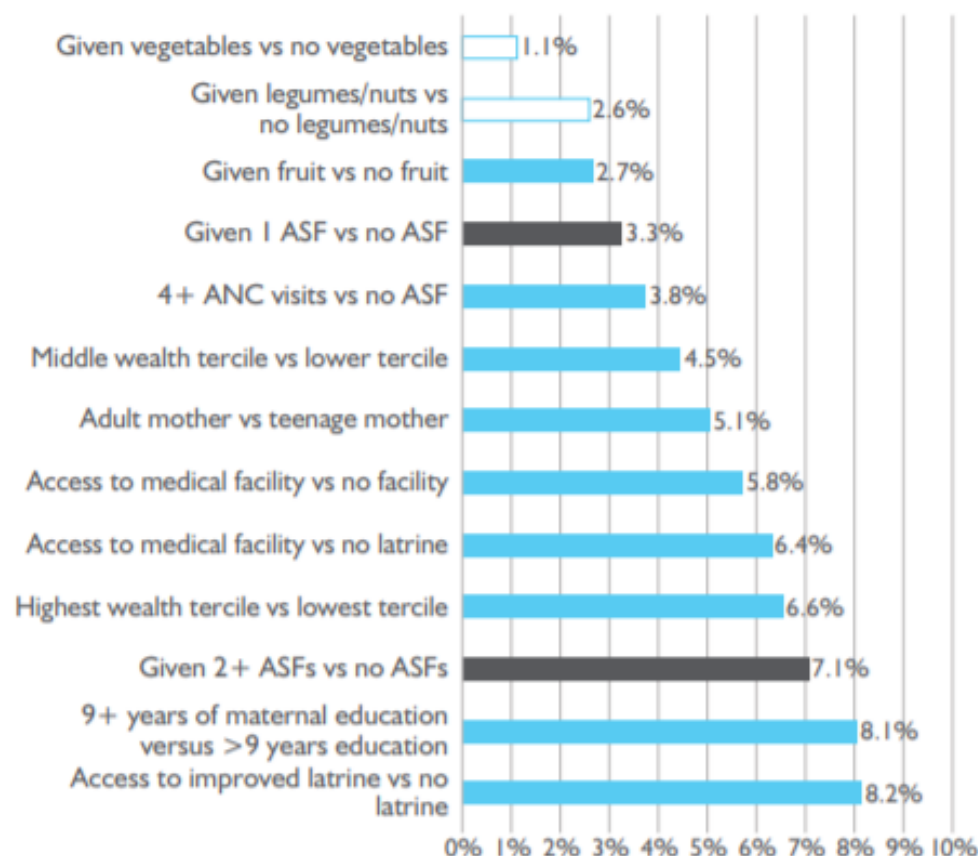
Regional analysis:

- Data from Latin American and Caribbean countries suggests dairy consumption reduces stunting by 4.4 percentage points and 5.6 for fish/meat.
- In North Africa and Western Asia, none of the coefficients were significant.
- In South, Central Asia and Eastern Asia dairy consumption suggests a 4.8 percentage point reduction in stunting.
- In Western and Central Asia, fish consumption implies a 4.3 percentage point reduction in stunting and egg consumption, a 3.1 point reduction. As a region, dairy consumption is low and the coefficient not significant. Taking the countries in the region where dairy consumption is common however, suggests a 7.1 percentage point reduction in stunting with high significance levels.

A LANSAs (Leveraging Agriculture for Nutrition in South Asia) Policy Brief uses survey data from India, Nepal, Bangladesh and Pakistan to investigate ASF intake (Headey, 2018). Children aged between 6 and 23 months who had eaten one ASF in the previous 24 hours ranged from 68 percent in Pakistan to 50% in India. Dairy was the most common source. Egg consumption was markedly higher in Bangladesh and Pakistan than in India and Nepal. Fish consumption was distinctly higher in Bangladesh where coastal ecology and the flood plain are suitable for production. Meat consumption was particularly low in India. Predicted percentage point reduction

in stunting from consumption of 1 ASF in a 24 hour-period is 3.3, and 7.1 for consumption of 2 ASFs. Figure 1 shows estimates of percentage decline in stunting given ASFs and other interventions.

Figure 1: Percentage point decline in child's risk of stunting given certain food intakes and different factors.



Source: Headey, D. (2018:3). *Animal sourced foods and child nutrition in South Asia: Policy priorities*. LANSa policy brief.
https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/13814/LANSa_PB11_Online2.pdf?sequence=1&isAllowed=y

A study in Kenya published in 2014 analysed consumption, nutrition and antropomotric data for 125 preschool children (Kisiangani et al., 2014). Stunting was found to have a statistically significant correlation with lack of consumption of fish and lack of consumption of eggs. A study published in 2006 measured 544 Kenyan school children over a 2-year period where ASFs were supplemented (Grillenberger et al, 2006). Improved height gain was evident in children who had been supplemented with ASF, though there was no control group.

4. Factors affecting ASF consumption

A study of constraints of ASF availability in Mexico, Peru, Haiti, Senegal, and Ethiopia identified community level barriers to be poverty, animal health and land degradation (Pachón et al., 2007).

Costs and limited livestock holdings were identified at the household level. And caregiver perceptions given at the individual level.

Gender bias can be a barrier to ASF consumption for girls (Jayachandran & Pande, 2017; Ndiku et al., 2011). In some countries there are food taboos around ASF consumption (Zerfu et al., 2016). Hindu populations, for example in India and Nepal, never consume non-dairy ASFs but do consume dairy (Headey, 2018).

Nutritional knowledge

Attempts to improve nutritional knowledge have had mixed results (Headey et al, 2018). For example, counselling, mass media and community mobilisation in Bangladesh improved complementary feeding practices but did not improve stunting (Menon et al, 2016).

Some communities already have knowledge of nutritional value of ASF as was identified in Kenya (Cornelson et al., 2016) and in Nepal (Darrouzet-Nardi et al., 2016)

Price

A study in urban Nairobi recorded household purchases of ASFs and reasons for consumption levels (Cornelson et al., 2016). Price was the most commonly reported barrier for consumption. As incomes rise, so does the demand for ASF. (Choudhury and Headey 2017b). Hygiene and the need for preservation make ASF more expensive.

A study comparing relative caloric prices for different food categories highlights ASF and fortified cereals as particularly high (Headey & Alderman, 2019). And that higher milk prices were associated with higher stunting rates.

Price ratios compared to cereal equivalent calories in staple cereals highlight price barriers (Headey et al., 2018). A large-scale study found:

- Fresh milk is 16.5 percent more expensive than equivalent calories from cereals in Western and Central Africa (13.9 in Eastern and Southern Africa; 10.1 in Middle East and North Africa; 7.8 in South, Central and South-East Asia; and 3.9 in Latin America and the Caribbean).
- Price ratios for processed cow's milk range from 3.0 (Latin America and Caribbean) to 5.8 (Eastern and Southern Africa).
- Ratios for chicken eggs range from 4.9 (Latin America and Caribbean) to 9.9 (Western and Central Africa).
- Ratios for meat range from 3.2 (Latin America and Caribbean) to 6.5 (South, Central, & Southern Asia).
- Ratios for fish range from 3.4 (Latin America and Caribbean) to 6.0 (Middle East and North Africa).

Meat is cheaper than eggs in some regions as they can be traded as live animals or treated for preservation. Agriculture, trade and value chain policies could help reduce relative prices (Headey et al., 2018).

A paper analysing long-term improvement in stunting in South Asia identified improvement in material well-being as particularly important. Improvement in wellbeing improves a family's ability to purchase ASF (Headey et al., 2016). The other two factors identified as most important were female education and improvements in sanitation.

Livestock production

A study in Ethiopia showed that children consumed higher quantities of milk when families owned cows (Hoddinott et al., 2015). However, a study in Uganda found that increased livestock production did not improve children's diets, weight for length or body mass index (BMI) (Whitney et al., 2018). A doctoral thesis investigated livestock ownership, livestock disease and child growth outcomes in large samples of children in Eastern Africa (Mosites, 2010). Findings were that household livestock ownership decreased stunting prevalence in Ethiopia and Uganda with a small effect size. There are validity concerns due to the fact that livestock ownership may be associated with other factors that reduce stunting. An association between stunting and livestock ownership was not found in Kenya. A trend where children affected by livestock disease grew less was observed in time-varying statistical models². Increased risk of disease associated with ASF production and consumption can be a problem. Children with households contaminated by animal faeces were more likely to be stunted in a multi-country study (Headey et al., 2017).

Examination of household dairy production and child growth in Bangladesh finds a positive association (Choudhury & Headey, 2018). The study also identifies a decline in breastfeeding rates where households produce dairy suggesting a need to improve local knowledge on breastfeeding practice. Another study in Kenya finds ownership of livestock and milk consumption to be associated with better nutrition outcomes (Wagah et al., 2015).

5. Evidence on increasing ASF consumption

A nutrition sensitive community-level programme in Nepal was carried out in six rural farming communities by Heifer International NGO (Darrouzet-Nardi et al., 2016). The training focussed on poverty alleviation, citizen empowerment, and community development with a strong focus on improving livestock management. It consists of women's self-help groups supplemented by workshops. Child diets were not specifically addressed. Anecdotal evidence suggested communities were aware of the benefits of ASF. After the programme children were found to have been 1.38 more times as likely to have consumed ASF than the control group. The study involved 431 households.

A health and nutrition education programme in rural India targeted pregnant women and mothers of preschool-age children (Murty et al., 2016). A survey of current knowledge was first carried out. After 3 years, results from the 335 targeted families showed frequency and quantity of egg consumption had more than doubled. Stunting was not specifically measured but a decline in moderate-to-severe malnutrition was identified over the three-year experimentation period.

A school feeding programme in rural Uganda supplemented children with eggs over a six-month period (Baum et al., 2017). Participants receiving 2 eggs per day (n=96) for 5 days a week had greater increase in height compared to those who received 1 egg per day (n=89) or the control group (n=56).

A scenario analysis investigates targeted investment to expand livestock production in South Asia and Sub-Saharan Africa (Enahoro et al., 2019). Predictions suggest that boosting productivity could improve food security and producer incomes whilst still limiting greenhouse

² Reflecting that disease is not constant over time

gas emissions and agricultural water usage. Investments to improve animal productivity reduces prices for consumers. Suggested improvements include technological advancement; and adaptation of livestock genetics, feeds and animal health solutions. Market-improving scenarios have more of a negative impact on environmental outcomes.

A review in the Journal of Child Health and Nutrition identifies several knowledge gaps investigating the role of ASF in diets for urban slum dwellers in Nairobi which should be addressed for effective programming (James & Palmer, 2015). The authors suggest information is needed on: 1) the minimum amount of ASF intake required to prevent stunting, 2) consumer preferences and how they interact with markets³ and income to enable effective promotion of ASF, 3) interaction between diet and enteric diseases and how this effects growth outcomes.

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³ See Headey et al., (2018) Rural food markets and child nutrition. Conference paper.

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